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MEDICAL
ACADEMY

SUBJECTS IN NUTSHELL FOR EFFECTIVE REVISION



ANATOMY IN NUTSHELL

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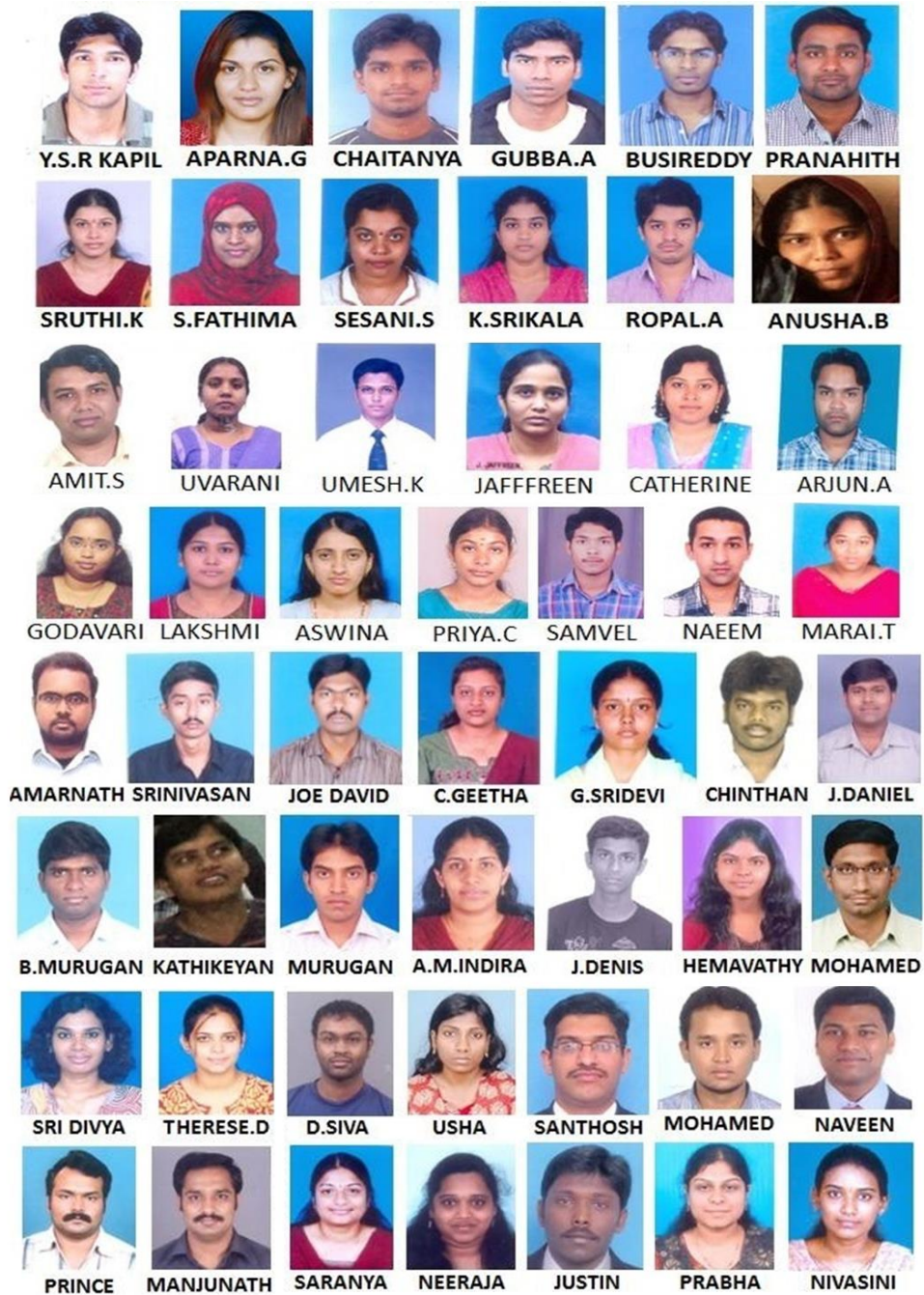
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Mobile: +91 9962850383 +91 9884329457

ELITE TEAM OF FACULTY



SOME OF OUR FMGE TOPPERS



DMA'S CORNER OF WISDOM

LOWER LIMB

BONES

HIP

	Male pelvis	Female pelvis
Subpubic angle	<80 °	>80-100°
Greater sciatic notch	<80 °	>80-100°
Ischial spine	inverted	Everted
Ischio pubic rami	Outside	Inside/inverted
Pre auricular sulcus	Shallow	Deep

Ilium

- Consists of a body and an ala (or wing)
- Body of ilium is fused with ischium and pubis and this forms about the superior 2/5th of the acetabulum
- The ala of ilium presents three surfaces
 - Gluteal
 - Sacropelvic surfaces
 - Iliac fossa
- These three surfaces are separated by three borders
 - Anterior- for gluteal surface (begins at ASIS and includes the anterior inferior iliac spine, situated superior to the acetabulum)
 - Posterior- for sacropelvic surfaces(begins at the PSIS and includes the posterior inferior iliac spine. It then runs anteriorly and forms greater sciatic notch)
 - Medial- for iliac fossa (includes anterior edge of the auricular surface -which is the iliac contribution to the sacro-iliac joint)

Ischium

- Forms the postero-inferior part of the hip bone
- Has a body and a ramus
- Body is fused with the ilium and pubis and forms posterior 2/5th of acetabulum
- Inferior end of the body forms ischial tuberosity, to which hamstrings muscles are attached
- The ischial tuberosity is covered by a bursa. This may become enlarged ("weaver's bottom") usually caused by prolonged sitting on hard surfaces .
- The ischial ramus extends medially from the body and tuberosity and joins inferior ramus of the pubis in such a way that it completes the inferior aspect of the obturator foramen

Pubis

- lowest and most anterior portion of the hip bones of the pelvis.
- The most anterior portion of the pubis, the pubic symphysis, is where the two hip bones of the pelvis are fused together.
- The pubis has a body, a superior ramus, and an inferior ramus. The superior ramus forms a portion of obturator foramen. The inferior pubic ramus joins with the inferior ramus of the ischium below the obturator foramen.
- The body of the pubis contributes to the lunate surface and acetabular fossa in the acetabulum.
- The pubic bone is covered by a layer of fat that is covered by the mons pubis.
- The two pubic bones joint anteriorly through the pubic symphysis, a cartilaginous joint.
- The pubic bone articulates with ilium and ischium on each hip.

Acetabulum

- Has incomplete crescent shaped articular surface
- Surface is deficient inferiorly
- Area of deficiency spanned by the acetabular ligament
- Central non-articular acetabular fossa contains a fat pad covered in synovial membrane
- Lip of acetabulum surrounded by acetabular labrum
- Labrum deepens the socket into which head of femur sits

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Femur

- Longest and heaviest bone in the body
- When a subject is in the standing position, the femur transmits weight from the hip bone to the tibia
- **Shaft of femur**
 - Shaft of femur is slightly twisted and curved w/ convexity forward, partially accounting for fullness of the anterior thigh
 - It is most nearly cylindrical in its middle third
 - Above & below it is sl flattened anteroposteriorly & widened, esp toward lower end
 - It flares posteriorly along linea aspera, where its cortical thickness is greatest
- **Neck shaft angle**
 - Adult- 126°
 - Child- 140°

Patella

- Sesamoid bone embedded in the tendon of insertion of the quadriceps femoris muscle
- This bone can be moved from side to side when the quadriceps is relaxed.
- ossifies from several centers
- Lateral dislocation is common – prevented by vastus medialis

Fibula

- Slender, lateral bone of the leg
- Not a weight bearing bone
- Articulates with the tibia superiorly and with the talus inferiorly
- **Inferior epiphysial line** of the fibula is in line with the superior surface of the talus in the ankle joint
- Biceps femoris is attached to head of fibula
- Common peroneal nerve winds from posterior to the head and onto the lateral aspect of the "neck of fibula"
- The Mc site to get fractured in fibula is its neck. This can lead to **foot drop**

Tibia

- Tibia is medial bone of the leg, also known as shinbone or shankbone
- **Length-** 1/5th of the body
- transmits the weight from the femur to the foot while in standing position
- The cross-section of tibia is triangular in shape.
- superior end of tibia articulates with inferior end of femur
- consists of medial and lateral condyles, and a tuberosity (anteriorly)
- The superior end of each condyle articulates with the corresponding femoral condyle.
- shaft of the tibia appears twisted when viewed from the superior aspect
- angle of tibial torsion = 15 to 20 degrees. This angle increase in early childhood.
- **BORDERS**
 - **Anterior border:** It descends from the tibial tuberosity to the medial malleolus. It is subcutaneous throughout the bone, except in its distal 1/4 where it is indistinct.
 - **Medial border:** It descends from anterior end of medial condyle to posterior margin of medial malleolus.
 - **Lateral (interosseous) border:** It begins anterior to the fibular facet and descends to the fibular notch (explained below). The interosseous membrane is attached to most of its length.
- **SURFACES**
 - **Anteromedial surface:** It lies between the anterior and medial borders, and is almost entirely subcutaneous.
 - **Lateral Surface:** It lies between the anterior and lateral borders.
 - **Posterior Surface:** It lies between the medial and lateral borders. The posterior surface of the tibia presents, at its upper part, a prominent ridge, the soleal line (also known as popliteal line),

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which extends obliquely downward from the back part of the articular facet for the fibula to the medial border

- **Blood supply-** A nutrient artery, as the main source, and periosteal vessels derived from the anterior tibial artery.
- **Tibial nerve**
 - Derived from L4, L5, S1, S2, S3
 - Continues its course down the leg, posterior to the tibia and during its descent, it supplies the deep muscles of the posterior leg.

NOTE

- Tibia has a rich blood supply with sizable feeding vessels. It can be used as free vascularized bone allograft. Its richly supplied periosteum can be used as vascularized periosteal allograft to treat nonunion fractures.

NERVE SUPPLY OF LOWER LIMB

- The principal nerves of the lower limb are Obturator Nerve, Femoral nerve, Sciatic Nerve and their branches.

OBTURATOR NERVE

ORIGIN	MUSCULAR INNERVATION AND MOVEMENTS			CUTANEOUS INNERVATION
Lumbo - sacral plexus (L2,L3,L4)	Lateral Rotators of thigh	Adductors of thigh	Adduction and Flexion of thigh	Superior and medial side of thigh
	Obturator externus	<ul style="list-style-type: none"> ✓ Adductor magnus ✓ Adductor longus ✓ Adductor brevis 	Gracilis	

LUMBAR PLEXUS

- Lies in the posterior part of the Psoas major muscle.
- Formed by the **ventral rami of the upper four lumbar nerves**.
- **Branches:**
 - ✓ Ilio Inguinal Nerve(L1)
 - ✓ Ilio Hypo gastric Nerve (L1)
 - ✓ Genito Femoral Nerve (L1,L2)
 - ✓ Lateral Cutaneous Nerve of thigh (L2,L3)
 - ✓ Femoral Nerve (L2,L3,L4 dorsal divisions)
 - ✓ Obturator Nerve (L2,L3,L4) Ventral divisions

FEMORAL NERVE

ORIGIN	MUSCULAR INNERVATION AND MOVEMENTS				CUTANEOUS INNERVATION
Lumbo - sacral Plexus (L2,L3,L4)	Flexors of thigh	Flexors of thigh and leg	Extensors of leg	Extensors of leg & Flexors of thigh	Anterior & lateral branches Supply the anterior and lateral thigh. Saphenous branch supply the medial leg and foot
	Psoas major Iliacus Pectineus	Sartorius	Vastus lateralis Vastus intermedius Vastus medialis	Rectus femoris	

SCIATIC NERVE

- **Thickest nerve in the body**
- **Largest branch of sacral plexus**
- **Root value L4,L5,S1,S2,S3**
- **Branches:** [Tibial Nerve, Common Peroneal Nerve]

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TIBIAL NERVE

MUSCULAR INNERVATION & MOVEMENTS	CUTANEOUS INNERVATION	BRANCHES
<ul style="list-style-type: none"> ○ Extensors of thigh & flexors of leg <ul style="list-style-type: none"> ● Biceps femoris (long head), Semi tendinosus ● Semi membranous ○ Adductors of thigh <ul style="list-style-type: none"> ● Adductor magnus ○ Plantar flexors of foot <ul style="list-style-type: none"> ● Plantaris, Gastrocnemius, Soleus, Tibialis Posterior ○ Flexors of leg <ul style="list-style-type: none"> ● Popliteus ○ Flexors of toe <ul style="list-style-type: none"> ● Flexor digitorum longus, Flexor hallucis longus 	<ul style="list-style-type: none"> ○ None 	<ul style="list-style-type: none"> ○ Medial and Lateral Plantar N <ul style="list-style-type: none"> ● Flexes and adducts toes & Plantar muscles ● Sensory to sole of foot ○ Sural Nerve <ul style="list-style-type: none"> ● Lateral & Post 1/3 of leg ● - Lateral side of foot

COMMON PERONEAL NERVE (COMMON FIBULAR NERVE)

MUSCULAR INNERVATION & MOVEMENT	CUTANEOUS INNERVATION	BRANCHES
<ul style="list-style-type: none"> ○ Extensors of thigh and flexors of leg ● Biceps femoris (short head) 	<ul style="list-style-type: none"> ○ Lateral surface of knee 	<ul style="list-style-type: none"> ● Deep Fibular N <ul style="list-style-type: none"> ✓ Dorsi flexes foot ✓ Tibialis anterior ✓ Peroneus tertius ✓ Extends toes <ul style="list-style-type: none"> ■ Extensor digitorum longus ■ Extensor hallucis longus ✓ Cutaneous innervation of great and second toe ● Superficial Fibular N <ul style="list-style-type: none"> ✓ Plantar flexes and everts foot <ul style="list-style-type: none"> ✓ Peroneus longus ✓ Peroneus brevis ✓ Extends toes <ul style="list-style-type: none"> ✓ Extensor digitorum brevis ✓ Cutaneous inn-over dorsal anterior 1/3rd of leg and dorsum of foot

MOVEMENTS OF HIP JOINTS

Movement	Chief Muscles
○ Lateral Rotators	○ Internal and External obturators, Superior and Inferior gemelli, Quadratus femoris
○ Medial Rotators	○ Tensor fascia lata, Gluteus medius, Anterior fibers of Gluteus minimus
○ Flexors	○ Psoas major, Iliacus
○ Extensors	○ Gluteus maximus, Hamstrings
○ Abductors	○ Gluteus medius, Gluteus minimus
○ Adductors	○ Adductor longus, Adductor magnus, Adductor brevis

MOVEMENTS OF KNEE JOINT

Movements	Principal Muscle	Accessory Muscle
Extension	Quadriceps femoris	Tensor fascia lata
Flexion	Biceps femoris, Semitendinosus Semi membranous	Gracilis, Sartorius, Popliteus
Medial Rotation of flexed leg	Semi membranous, Semitendinosus Popliteus	Gracilis, Sartorius
Lateral Rotation of flexed leg	Biceps femoris	

- **Biceps femoris:**

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- Origin: Long head → upper part of ischial tuberosity
Short head → from the lateral lip of linea aspera, upper 2/3rd of lateral supra-condylar line
- Insertion: To Head of the fibula
- Nerve supply:
 - Long Head → Tibial part of sciatic nerve
 - Short Head → Common Peroneal part of sciatic nerve

LOWER LIMB JOINTS & THEIR MOVEMENTS

- **Ankle joint:**
 - Dorsiflexion & Plantar flexion
- **Subtalar (Talo-calcaneal joint):**
 - Inversion & Eversion
 - Adduction & Abduction (some extent)
- **Mid-Tarsal (Calcaneo-cuboid & Talo-Navicular) Joint:**
 - Fore-foot adduction & abduction
 - Inversion & Eversion (some extent)

Muscles acting at Ankle Joint & Subtalar Joint

Movement	Main Muscle	Accessory Muscle
Plantar Flexion	Gastrocnemius, Soleus	Plantaris, Tibialis Posterior, Flexor Hallucis Longus (FHL), Flexor Digitorum Longus (FDL)
Dorsi Flexion	Tibialis anterior	Peroneus tertius, EHL, FDL
Inversion	Tibialis anterior, Tibialis Posterior	FHL/FDL
Eversion	Peroneus longus, Peroneus brevis	Peroneus tertius

VENOUS DRAINAGE OF LOWER LIMB

1. **Superficial Veins**
 2. **Perforating Veins**
 3. **Deep Veins**
 - Anterior tibial V
 - Posterior tibial V
 - Peroneal V
 - Popliteal V
 - Femoral V

Great or Long saphenous V

Short saphenous V

→ Connects superficial Veins to deep Veins

GREAT SAPHENOUS VEIN (GSV)	SHORT SAPHENOUS VEIN(SSV)
<ul style="list-style-type: none"> • Formed by union of medial end of dorsal Venous arch with medial marginal Vein (dorsal V of great toe) • Ascends anterior to medial malleolus • Accompanied by saphenous nerve • Drains into Femoral Vein 	<ul style="list-style-type: none"> • Formed by union of lateral end of dorsal venous arch with lateral marginal Vein • Ascends posterior to lateral malleolus • Accompanied by Sural Nerve • Ascends between two head of Gastrocnemius and drains into Popliteal Vein

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PERFORATORS

- Allows one way flow of blood (superficial → deep veins)

Perforators for GSV (5 in number)	Perforators for SSV (only one)
<ul style="list-style-type: none"> Three medial Perforators at ankle <ul style="list-style-type: none"> ✓ Connects Posterior arch Vein to Posterior tibial Vein One Perforator just below knee <ul style="list-style-type: none"> ✓ Connects GSV or Posterior arch Vein with Posterior tibial Vein One Perforator in adductor canal: <ul style="list-style-type: none"> ✓ Connects GSV with femoral Vein 	<ul style="list-style-type: none"> In leg at middle and lower 1/3rd junction Connects SSV with Peroneal Vein

Salient Points:

- Tributaries of Great Saphenous Vein**
 - ✓ Superficial Circumflex iliac. Vein
 - ✓ Superficial epigastric Vein
 - ✓ Superficial external pudendal Vein
- All these Veins drain to GSV at the saphenous opening.

MUSCULAR COMPARTMENTS OF LOWER LIMB:

MUSCULAR COMPARTMENT	MUSCLES	NERVE SUPPLY
Adductor Compartment (Medial Comp.) of thigh	<ul style="list-style-type: none"> Gracilis, Adductor longus Adductor brevis Adductor magnus Pectineus 	<ul style="list-style-type: none"> Obturator N Obturator Obturator nerve & tibial part of sciatic .N Obturator.N
Flexor compartment (Anterior Comp.) of thigh	<ul style="list-style-type: none"> Sartorius Iliacus Psoas Pectineus Quadriceps femoris 	Femoral.N
Posterior compartment of thigh	<ul style="list-style-type: none"> Semitendinosus, Semimembranosus Adductor magnus, Biceps femoris (Long head) Biceps femoris (Short head) 	<ul style="list-style-type: none"> Tibial portion of sciatic.N Common Peroneal portion of sciatic.N
Anterior compartment of leg	Tibialis anterior, EHL, EDL, EDB, Peroneus tertius	Deep peroneal. N
Lateral compartment of leg	Peroneus longus, Peroneus brevis	Sup. Peroneal. N
Posterior compartment of leg	Gastrocnemius, Plantaris, Soleus, Tibialis posterior, FHL, FDL, Popliteus	Tibial.N
Gluteal region	<ol style="list-style-type: none"> Gluteus maximus Gluteus medius, minimus Tensor fascia Lata. Quadratus Femoris, Inferior gemellus Obturator internus, Superior gemellus Obturator externus Pyramidalis 	<ol style="list-style-type: none"> Inferior gluteal.N Superior gluteal.N Nerve to quadrates Nerve to Obturator internus. Obturator nerve

FEMORAL CANAL:

- It is the medial compartment of the femoral sheath.
- Base or upper end of the canal-Femoral ring.
- Boundaries:**

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- ✓ Anterior - Inguinal ligament.
- ✓ Posterior - Pectineus.
- ✓ Medially - Concave margin of lacunar lig.
- ✓ Laterally - A septum separating it from the femoral V.
- ✓ The Inferior epigastric vessels are closely related to the junction of the anterior and lateral walls.
- **Contents:**
 - ✓ Lymph node of cloquet or Rosenmuller
 - ✓ Drains glans penis in males & clitoris in females.
 - ✓ Lymphatics, Areolar tissue.

FEMORAL TRIANGLE:

- **Borders:**
 - ✓ Medial border of sartorius muscle.
 - ✓ Medial border of adductor longus muscle.
 - ✓ Inguinal ligament: From ASIS to pubic tubercle.
- **Contents (lateral to medial):**
 - ✓ Femoral Nerve (not in femoral sheath)
 - ✓ Femoral Artery (in femoral sheath)
 - ✓ Femoral Vein (in femoral sheath)
 - ✓ Lymphatics (in femoral sheath)
- **Floor:**
 - Iliopsoas muscle.
 - Pectineus muscle.
 - Adductor longus muscle

Anterior Compartment of Thigh

- **Cutaneous Innervation:**
 - Femoral cutaneous nerves:
 - ✓ Lateral
 - ✓ Intermediate
 - ✓ Medial
 - ✓ Posterior
- **Cribriform fascia and fossa ovalis:**
 - Opening for great saphenous vein:
 - ✓ Empties into femoral vein.
 - ✓ Drains medial side of dorsal venous arch.
 - ✓ May be duplicated distal to the knee.
 - ✓ **Has 10 to 20 valves.**
- **Muscles:**
 - Iliopsoas.
 - Sartorius.
 - Pectineus.
 - Quadriceps:
 - Rectus femoris.
 - Vastus lateralis.
 - Vastus intermedius.
 - Vastus medialis.
- **Blood Supply:**
 - Femoral Artery:
 - ✓ Superficial circumflex iliac.
 - ✓ Superficial epigastric.
 - ✓ Superficial external pudendal.
 - Deep external pudendal.
 - Descending genicular.

Adductor Canal:

- **Borders:**
 - Lateral:
 - ✓ Vastus medialis muscle.
 - Anteromedial:
 - ✓ Sartorius muscle.
 - Posterior:
 - ✓ Adductor longus and magnus.

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○ Contents:

- Saphenous nerve:
- Termination of femoral nerve.
- Nerve to vastus medialis.
- Terminal part of obturator nerve.
- Terminal parts of femoral artery and vein.
- Deep lymph vessels.

Medial Compartment of Thigh

- Muscles:
 - ✓ Gracilis.
 - ✓ Adductor longus.
 - ✓ Adductor brevis.
 - ✓ Adductor magnus.
 - ✓ Obturator externus.
- Blood Supply:
 - ✓ Obturator artery: Branch of internal iliac artery.
- Innervation:
 - ✓ Obturator nerve.
 - ✓ Tibial nerve: To hamstring portion of adductor magnus.
- Action:
 - ✓ Adduction

Posterior Compartment of Thigh

- Muscles:
 - ✓ Hamstrings:
 - ✓ Biceps femoris:
 - Long head.
 - Short head.
 - ✓ Semimembranosus.
 - ✓ Semitendinosus.
 - ✓ Adductor Hiatus
- Innervation:
 - ✓ Common peroneal nerve: To biceps femoris brevis.
 - ✓ Tibial nerve:
- Vascular Supply:
 - ✓ Perforating arteries (from profunda femoris)
- Action:
 - ✓ Hip extension.
 - ✓ Knee flexion

Ligament and their Features

- Coraco - acromial lig - Prevents Superior displacement of humeral head.
- Costo - Clavicular lig - Transmits some weight of upper limb to 1st rib
- Coracho - Clavicular lig - Transmits weight of upper limb to axial skeleton
- Gastro splenic lig - Contains short gastric vessels
- Lienorenal lig - Contains splenic vessels & tail of pancreas
- Pubofemoral lig - Prevents over abduction of hip joint
- Ischiofemoral lig - Prevents hyperextension of hip joint (some extent)
- **Ilio - femoral or Bigelow lig:** Strongest ligament in the body
 - ✓ Prevents trunk from falling backwards
 - ✓ Prevents hyperextension of hip joint during standing

LIGAMENTS OF ANKLE JOINT

- **Fibrous Capsule:** supported by strong collateral ligaments on each sides.

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- Surrounds the joint and is attached all around the articular margins except
 - ✓ Postero - Superiorly - attached to inferior transverse tibio - fibular lig
 - ✓ Antero - inferiorly - attached to dorsum of neck
- **Deltoid or Medial lig:**
 - Very strong triangular ligament present on the medial side.
 - Two part - Superficial & deep
 - Both parts attached to medial malleolus
- **Superficial Part**
 - Anterior / Tibionavicular fibres
 - ✓ Attached to the tuberosity of navicular bone to medial margin of spring lig.
 - Middle/Tibiocalcanean fibres
 - ✓ Attached to whole length of sustentaculum tali
 - Posterior/Posterior tibiotalar fibres
 - ✓ Attached to medial tubercle & medial surface of talus.
- **Deep (anterior tibio talar) fibres:**
 - Attached to anterior part of medial surface of the talus
- **Lateral lig:** Have 3 bands
 - Anterior talofibular lig: From lateral malleolus to the neck of talus.
 - Posterior talofibular lig: From malleolar fossa of the fibula to the lateral tubercle of the talus
 - Calcaneofibular lig: From lateral malleolus to the lateral surface of the calcaneum.

LIGAMENTS OF THE KNEE JOINT

- **Fibrous capsule:** Ligaments: coronary ligament short lateral ligament.
- **Ligamentum patellae:** Common tendon of insertion of the **quadriceps femoris**
- **Medial (tibial collateral) lig:** Corresponds to the degenerated tendon of the **adductor magnus**
- **Fibular (Lateral collateral) lig:** Represents the femoral attachment of the **peroneus longus**
- **Oblique Popliteal lig:** Expansion from the tendon of the **semimembranosus**.
- **Arcuate Popliteal lig:** Posterior expansion from the short lateral lig.
- **Cruciate lig :(Anterior posterior)** Very thick and strong fibrous bands.
 - ✓ Acts as a direct bonds of union between tibia and femur
 - ✓ Maintain anteroposterior stability of knee joint
- **Menisci (semilunar Cartilages):** Deepen the articular surfaces of the condyles of the tibia
- **Transverse lig:** Connects the anterior ends of the medial & lateral menisci.

FEMORAL SHEATH

- Funnel shaped sheath enclosing the upper 3-4cm of the femoral vessels
- IT is formed by downward extension of two layers of the fascia of the abdomen
- The sheath is divided into the following three compartments by septa
 - Lateral /Arterial compartment:
 - ✓ Contains femoral-A and the femoral branch of the genito femoral Nerve.
 - Medial /Lymphatic compartment:
 - ✓ Smallest of all, called as femoral canal.
 - Intermediate /Venous compartment:
 - ✓ Contains the femoral-V

COURSE OF FEMORAL NERVE

- Enters the femoral triangle by passing behind the inguinal lig, lateral to the femoral. A.
- It lies in the groove between the Iliacus and the Psoas major, outside the femoral sheath.

Guy ropes: 3 Muscles are inserted into the upper part of medial surface of tibia from 3 compartment of thigh

- **Sartorius – belongs to anterior Compartment**
- **Gracilis – belong to medial compartment**
- **Semitendinosus – belongs to posterior Compartment.**

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MUSCLES OF THE SOLE & THEIR INNERVATION

Layers of the sole	Muscles & Action	Innervation
First Layer	a. Flexor digitorum brevis Flexion of toes	Medial plantar.N
	b. Abductor hallucis Abduction of great toe	Medial plantar.N
	c. Abductor digiti minimi Abduction of little toe	Main trunk of lateral plantar.N
Second Layer	a. Flexor digitorum longus Plantar flexion of lateral four toes Plantar flexion of ankle	Tibial.N
	b. Flexion of toes (Flexor digitorum accessorius)	Main trunk of lateral plantar.N
	c. Lumbricals (Extension of the digit)	First - by Medial plantar.N other three Deep br.of lateral plantar.N
	d. Flexor hallucis longus (Plantar flexion of big toe, ankle joint)	Tibial.N
Third Layer	a. Flexor Hallucis brevis (Flexion of proximal phalanx of great toe)	Medial plantar.N
	b. Adductor Hallucis (Adduction of great toe)	Deep br.of lateral plantar.N (terminates in this muscle)
	c. Flexor of minimi brevis (Flexion of proximal phalanx of little toe)	Superficial br.of lateral plantar N
Fourth Layer	a. Plantar interossei (adductors)	
	b. Dorsal interossei (adductors)	

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China Helpline :+8615940651819

Chennai: F-161, 1st Floor, 3rd Phase, #768, Spencer Plaze, Anna Salai, Chennai - 600 002

Headoffice: No: 291/139, Illrd Floor, Thambu Chetty Street, Parrys, Chennai-600001, Tamilnadu, India.

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